

Certifying Multiple Radian RD Series Reference Standards with the RS703 Laboratory Calibration System



Hardware and Software Requirements

1) Two or more RD-20, RD-21, or RD-23 Reference Standards (Devices Under Test - DUT's)

2)RS703 Automated Laboratory Test System

3)120V VAC Auxilliary Power Input Cable (Radian part no. 194015)

4) Pairs of 1ft Black and Red Input Voltage/Current Cables (Radian part no.'s: 5210202 [black], 5210203 [red])

5) Right Angle Current Adaptors (Radian part no. 5460060)

6) 1.25ft Current Jumpers (Radian part no. 190074)

7) BNC-BNC Input Cables (Radian part no.'s RM-1C, RM-2C, RM-3C)

Any work with the RS-703A Automated Calibration System, RS-703A accessories, energized standards and energized meters can present the danger of electrical shock. The RS-703A and its accessories should be operated by qualified personnel. The information provided in this instruction set is intended to serve as a guide for properly qualified electric utility personnel. This instruction set is not intended to replace existing electric utility safety procedures and those listed in the Handbook for Electricity Metering.

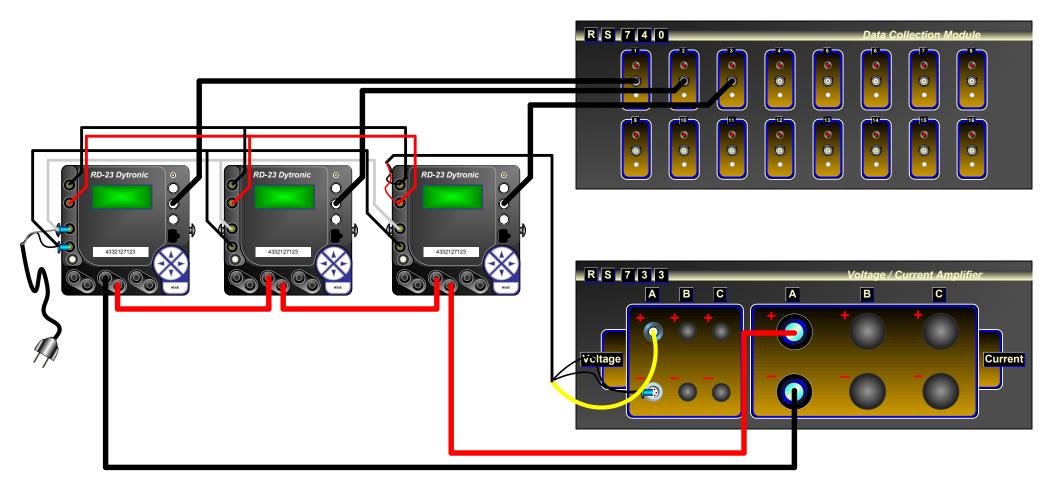
Operation of the RS-703A should not be conducted if the work area is wet or damp. Operation should also not be conducted if flammable gases or fumes are present in the work area. When using the RS-703A never make voltage and current connections/disconnections when the system is live. For service or repairs to the RS-703A contact Radian Research, Inc. Do not attempt to service or make modifications to the RS-703A due to the risk of electrical shock.

Radian Research, Inc. assumes no liability for failure to comply with existing applicable safety precautions as well as those listed in this warning statement.



Hardware Setup

- 1. With the 703 System completely powered OFF, ensure the following:
 - a) the external potential (BNC and LEMO connectors) and current (locking connectors) cables are securely connected to the RS-733 front panel
 - b) the control PC's monitor, mouse, and keyboard are connected
 - c) the 703's main power cable is connected to the power source
- 2. Make all the necessary hardware connections, as shown in the diagram below.



Hardware Setup



2.a. Using a 120V VAC Auxilliary Power Input Cable and pairs of 1ft black and red input voltage/current cables, apply 120VAC to each of the DUT's auxiliary power inputs. Ensure that the auxiliary power is connected in a parallel configuration.

2.b. Using a BNC-BNC cable, connect port two of the first DUT to channel one of the RS-740 front panel. Repeat for each additional DUT, using sequential channels of the RS-740.

2.c. Using the External Potential Cable and pairs of 1ft black and red input voltage/current cables, connect the potential output to each of the DUT's potential inputs. Ensure that the potential is connected in a parallel configuration.

2.d. Using the External Current Cable, Right Angle Current Adaptors, and Current Jumpers, connect the current output to each of the DUT's "B" current inputs. Ensure that the current is connected in a series configuration.

3. Ensure that each DUT is configured as follows (consult the reference standard's operations manual for details):

a) Port 2: Wh

b) Pulse Constant: 0.00001 Wh/Pulse

c) Port Polarity: "+"

4. Turn the system on by rotating the key switch 90° clockwise. The system will turn on and the cooling fan will start.

5. Turn on the computer by switching both the back and front power switches to the ON position.



Opening Application:

1. Open the 703 Control Software by double-clicking the application's icon, located on the computer's desktop. A pop-up screen will briefly flash on the screen, and a short delay will follow. The control application will then open and proceed with a self diagnostic routine.

2. Wait until the diagnostic routine is completely finished. The application opens with the *Channel Table* window open

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🗷 Channel Table	
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Associate DUT's to Channels:

1. For the first DUT, click on the *Channel 1* selection box. A *Select Device* window will appear.

From this window, select the applicable device name. (If one does not exist for the DUT to be tested, select *New* - Follow the process for creating a new device, located in Appendix 1.) Select *OK*. This action will associate the specific device type with Channel 1.

🔁 RS-703A Control Program DEMO Mode		
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R Channel Table		
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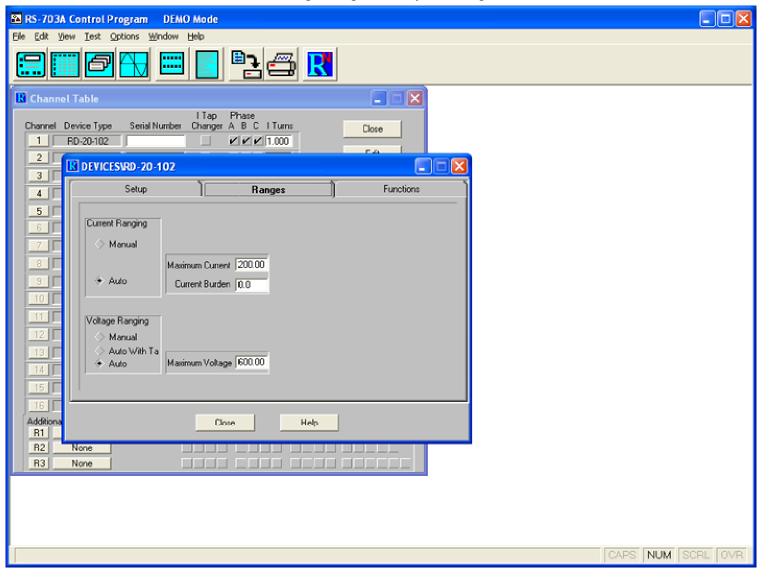
2. Re-click on the *Channel 1* selection box. The associated device's configuration card will be displayed. Ensure that the device is configured as follows:

Setup tab: Device Type: Standard Phases: Single phase Min Pulse Count: 100 Testing Method: Pulse Pulse Output Pullup: 150 Ohms (33ma) Standard Options: Ramp Rates (seconds): Up = 0.7, Down = 0.7

🕰 RS-703A Control Program DEMO Mode	
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Ranges tab: Current Ranging: Auto Maximum Current: as specified by DUT's specifications Current Burden: 0.0 Voltage Ranging: Auto Maximum Voltage: as specified by DUT's specifications





Functions tab: Function: select functions applicable to DUT's supported measurement parameters Pulse Factor: 0.00001 Tolerance: as specified by DUT's specifications Measurement Modes: check Wye only

🖾 RS - 703A. Control Program 🛛 DEMO Mode	
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- 3. Select *Close*. If prompted, save any unsaved changes.
- 4. Enter the DUT's serial number.

🖾 RS-703A Control Program DEMO Mode	
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2 Edit	
3 Disconnect	
4 Disconnect Al	
6 Help	
7 Voltage Tap Changer	
Comm Connections:	
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Additional results: S/N or Ref 1 2 3 4 5 6 7 8 9 10 11 12 13 14 R1 None Image: Signal and Si	
	CAPS NUM SCRL OVR

5. Ensure that *I Tap Changer* is unchecked, only *Phase A* is checked, and *I Turns* is set to 1.000.

6. Repeat the DUT association procedure for all remaining DUT's, using sequential channels.



Test Setup:

1. From the icon menu bar, select the Open a Test icon. A Open window will appear.

Open		
Test name: Amp meter Meters NIST Radian Standards RS-703A Certify SC Standards Volt meter	Directories: Root Radian Cal Tests RD-2x Tests	OK Cancel New
List Files of Type Test		Help



2. From this window, select *"Radian Standards"* from the list provided. Select *OK*. The selected *Test* window will appear, with the previously associated DUT's listed on the right-hand tabs.

🔀 RS-703A Control Program DEMO Mode	
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Default Consecutive Contag Trim PF: Doc Close Help Run Pause Lock Skip	
	CAPS NUM SCRL OVR

3. This *Test screen* will include all the test points to be executed. Any of the Current, Voltage, and/or Phase values can be modified by clicking on that particular value.

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1.5	\diamond	12.0	\diamond	50.0						

4. Ensure that the test options are configured as follows:

Phase: A Point Order: select per user's preference Function: Wh - Watt Hours Net A-B phase: 0.0 A-C phase: 0.0 Consecutive Voltage: unchecked Consecutive Current: unchecked Stabilization Time: select per user's preference Test Time: select per user's preference Frequency: 60.000 (US); 50.000 (International) Pulse Constant: 0.00001 Voltage Wave: Pure *see Appendix 3 Current Wave: Pure *see Appendix 3 Warm Up: unchecked



Running A Test

1. Select *Run*. The test will automatically start with the first test point and continue until all test points have been executed.



Saving, Veiwing, and Exporting Results Data

- 1. Once the test is complete, the resulting test data will automatically be saved in the 703's results database.
- 2. To view the results data, select the View test results icon. This will open a Report window.

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2.a. From the *Serial Number* drop-down menu, select the desired serial number.

RS-703A Control Program DEMO Mode	
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2.b. From the *Date* drop-down menu, select the desired date. The desired results data will appear.

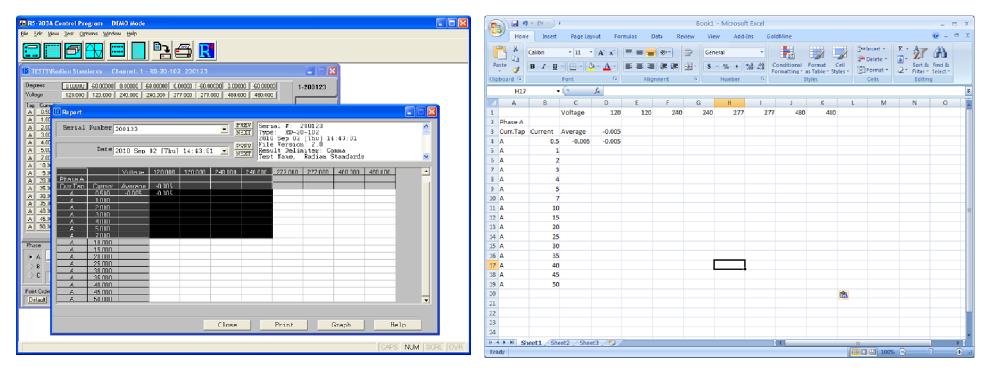
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											CAPE	NUM SCF	LOVR



Saving, Veiwing, and Exporting Results Data

3. To export the data into an Excel spreadsheet, use the mouse to highlight the entire test results grid. Copy the data by simultaneously pressing the [Ctrl] key and the [C] key.

- 4. Open a new Microsoft Excel spreadsheet.
- 5. Paste the data by simultaneously pressing the [Ctrl] key and the [V] key.





- 1. To create a new test device, click on the *Channel 1* selection box.
- A *Select Device* window will appear.

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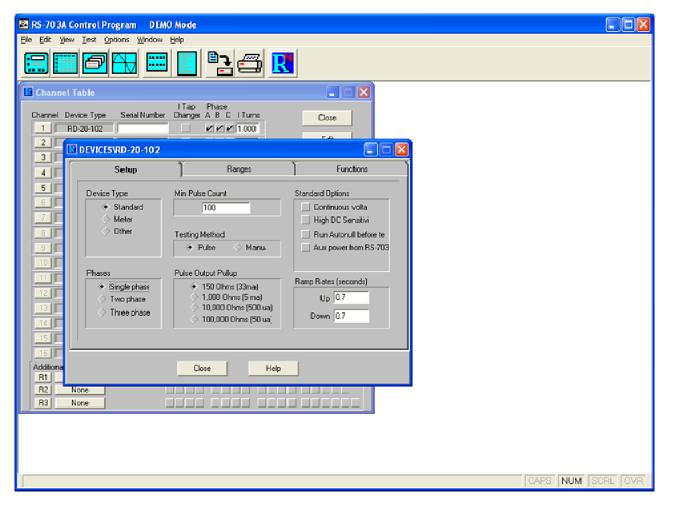
2. From this window, select the New button. A new device configuration window will appear.

Select Device		
Device name: Email_Q4 RD-20-001 RD-20-002 RD-20-032	Directories: Radian Cal Devices Meters Radian Cal Devices Radian Standards Scientífic Columbus	OK Cancel
RD-20-102 RD-20-103 RD-20-104	Scientific Columbus	New
List Files of Type Device		Help



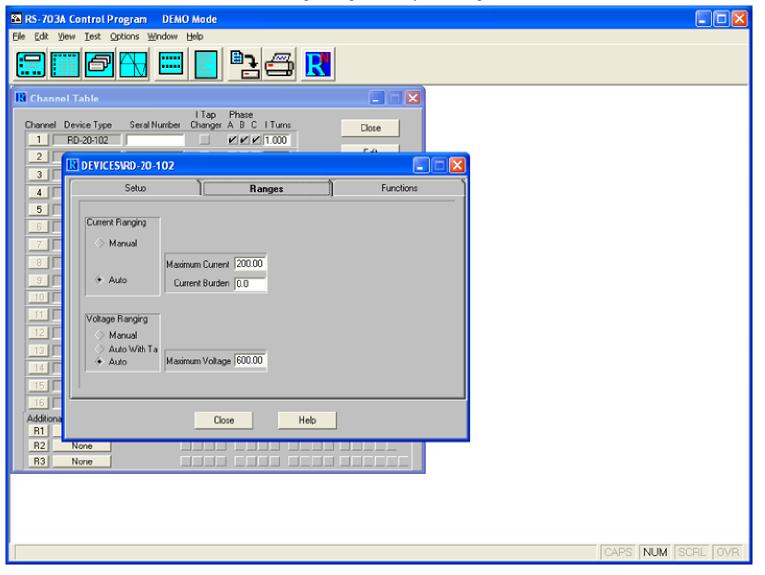
3. Ensure that the device is configured correctly:

Setup tab: Device Type: Standard Phases: Single phase Min Pulse Count: 100 Testing Method: Pulse Pulse Output Pullup: 150 Ohms (33ma) Standard Options: Ramp Rates (seconds): Up = 0.7, Down = 0.7





Ranges tab: Current Ranging: Auto Maximum Current: as specified by DUT's specifications Current Burden: 0.0 Voltage Ranging: Auto Maximum Voltage: as specified by DUT's specifications





Functions tab: Function: select functions applicable to DUT's supported measurement parameters Pulse Factor: 0.00001 Tolerance: as specified by DUT's specifications Measurement Modes: check Wye only

💀 RS-703A Control Program 🛛 DEMO Mode	
File Edit View Test Options Window Help	
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4. Select Close. If prompted, save any unsaved changes.



Appendix 2: Options/Configure Menu

Result	Test	Hardware	Comm	Result]	Test) Hardwar	re) C
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This screen allows the user to select how the resulting data will be displayed, the file type, the number of significant digits in the results data, and the company name.

This screen allows the user to select the type of test (standard and polyvariable), the phase relationships, the test point order, the time-out delay, the power factor display, and the averaging method.



Appendix 2: Options/Configure Menu

Configuration	
Result	Test Hardware Comm
Active Phases	Optional Equipment T ap Changers Meter Adapter Env. Chamber Chamber Type Wattlow Chamber Com Port: Com 1 ▼ Chamber 3 KR-CF RR-CF RR-CR Com Port: Com 2 ▼
ок	Cancel Help

Result Test	Hardware Comm
Comm Enable mmunication cable types RM-PCA Rev 1 cable RM-PCA Rev 2 cable RD-xx Direct MTE Direct	Select Com Ports Com 1 Com 8 Com 15 Com 2 Com 9 Com 16 Com 3 Com 10 Com 17 Com 4 Com 11 Com 18 Com 5 Com 12 Com 20
M-PCA Rev 2 cable D-xx Direct	🗌 Com 4 🗹 Com 11 🗌 Com 18

This screen allows the user to select the active phases and configure a temperature chamber control.

This screen allows the user to configure the serial communications to the devices under test.



Appendix 3: Creating Voltage and Current Signals with Harmonic Content

1. Click on the Open a Wave icon. A Open window will appear.

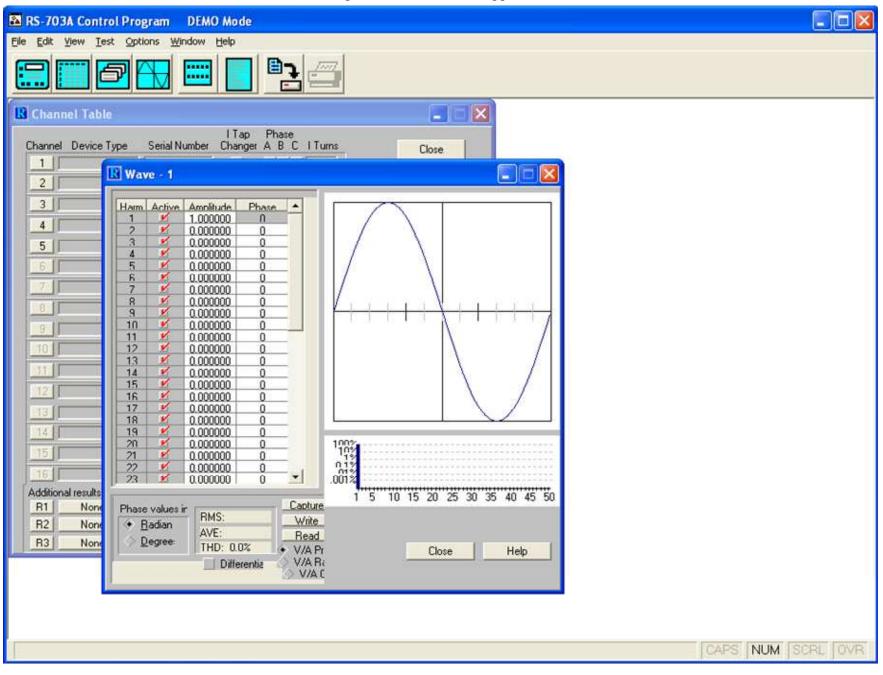
Channel Table	Open a Wave		
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8			Comm Connections:
15 16 Additional results: R1 None R2 None R3 None	S/N or Ref 1		Refresh 8 9 10 11 12 13 14

Wave name:	Directories: Radian Production	OK
Pure		Cancel
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ist Files of <u>T</u> ype		Help



Appendix 3: Creating Voltage and Current Signals with Harmonic Content

2. Select the New button. A new Wave configuration window will appear.





Appendix 3: Creating Voltage and Current Signals with Harmonic Content

3. Enter the harmonic amplitude and phase parameters. The displayed waveform will change accordingly. Select the *Close* button and save changes when prompted.

RS-703A Control Program DEMO Mode	
jle Edit View Iest Options Window Help	
Channel Table	
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